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AN ANALYSIS OF THE FACTORS AFFECTING
CENTRALIZED VERSUS DECENTRALIZED
MANAGEMENT OF SUPPLY ITEMS

WAYNE R. CROZIER
FREDERICK B. JOHNSTON

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AN ANALYSIS OF THE FACTORS AFFECTING
CENTRALIZED VERSUS DECENTRALIZED
MANAGEMENT OF SUPPLY ITEMS

* * * * *

Wayne R. Crozier

and

Frederick B. Johnston

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AN ANALYSIS OF THE FACTORS AFFECTING
CENTRALIZED VERSUS DECENTRALIZED
MANAGEMENT OF SUPPLY ITEMS



by

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Submitted in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE
IN
NAVAL MANAGEMENT

United States Naval Postgraduate School
Monterey, California

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This work is accepted as fulfilling
the research paper requirements for the degree of

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IN

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ABSTRACT

The General Accounting Office, in a report on uneconomical management of commercially available supply items, subjected the Department of Defense and the Navy Department to extensive criticism concerning their centralized management of supply items. This research paper examined the GAO report and determined that, while the financial savings and statistical methods employed left some doubt as to the validity of the results, it was obvious that commercially available items were being centrally managed uneconomically. This paper examined the known factors affecting the decision, both economic and noneconomic. It was concluded that a mathematical model could be developed incorporating these factors that would be applicable service-wide and permit the inventory manager to make a management decision on decentralization. However, several of the factors require more analysis and it was recommended that further studies be conducted in these areas. It was finally noted that the decentralization decision should be approached with caution in order not to obviate the gains already made by the Defense Supply Agency and the Navy in item reduction, elimination of duplication, and distribution of excesses.

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TABLE OF CONTENTS

CHAPTER

I.	THE PROBLEM AND DEFINITIONS OF TERMS USED	1
	The Problem	1
	Definitions of Terms Used	2
II.	DISCUSSION OF PRESENT CRITERIA FOR DETERMINING DECENTRALIZED MANAGE- MENT	4
III.	ANALYSIS OF GENERAL ACCOUNTING OFFICE REPORT	7
	Method of Determining Costs	7
	Cost Savings	9
	Statistical Methods	12
IV.	FACTORS AFFECTING MANAGEMENT CRITERIA	21
	Non-economic Factors	21
	Economic Factors	40
	Mathematical Model of Economic Factors	48
V.	CONCLUSIONS AND RECOMMENDATIONS . . .	51
	Conclusions	51
	Recommendations for Further Study	54
	BIBLIOGRAPHY	58

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

The General Accounting Office (GAO), an agency in the Legislative Branch of the Government headed by the Comptroller General, is responsible solely to the Congress. The Congress has directed the Comptroller General to perform "external" audits of all expenditures made by Departments of the Executive Branch to insure that public funds are being expended in accordance with appropriations.¹ As part of their responsibilities the General Accounting Office published Report Number B-146828, titled "Uneconomical Management of Commercially Available Items". The report subjected the Department of Defense, and the Defense Supply Agency to extensive criticism over the decision of central management versus decentralized management of commercially available items of supply.

I. THE PROBLEM

Statement of the problem. It is the purpose of this paper to (1) analyze the GAO report in detail; (2) identify factors affecting centralized versus decentralized management

¹ Budget and Accounting Act, 1921 (31 U.S.C. 53), and Accounting and Auditing Act, 1950 (31 U.S.C. 67)

of supply items; and (3) to develop a model which will aid inventory managers in making supply management decisions.

II. DEFINITIONS OF TERMS USED

Centralized management. Inventory control points are responsible for all interrelated functions pertaining to the supply of items specified. These functions include cataloging, determination of requirements, procurement, storage, and distribution.

Decentralized management. Authority is delegated to using activities, or in some cases subordinate supply levels, to procure their requirements of specified items from commercial sources, other military activities, or other Government activities such as the General Services Administration. This procedure is known, generally, as local purchase or base procurement.

Economic Order Quantity (EOQ). A supply technique used to compute replenishment order quantities of consumable material whereby the cost to order is equated against the cost of carrying the inventory to achieve the most economical procurement, storage and inventory practices.

Military specifications. Documents intended primarily for use in procurement, which are clear, accurate descriptions of the technical requirements for items, materials, or services, including the procedures by which it will be

determined that the requirements have been met. Specifications for items and materials also contain preservation, packaging, packing and marking requirements.

Central procurement. The process of acquiring material to meet service-wide requirements. It includes the functions of design, standards determination, specification writing, selection of suppliers, financing, contract administration, and other related functions.

Local procurement or purchase. Procurement of material by an installation for consumption at that installation or its satellited activities or smaller stations.

Requisition, Material. An authorized request or order for specified material submitted by a user or distribution point on a designated supplying point in accordance with the supply procedures of the military service involved.

Automatic data processing (ADP). The processing (classifying, sorting, calculating, summarizing, recording, printing) of data through the use of electronic digital computers, communications channels and devices used with such computers, and associated peripheral equipment. Includes preparation of source data in form appropriate for such processing.

CHAPTER II

DISCUSSION OF PRESENT CRITERIA FOR DETERMINING DECENTRALIZED MANAGEMENT

A review of the available directives, instructions, and the GAO report reveals that the policy and the criteria for determining which items of supply shall be centrally managed and which items shall be decentrally managed vary between services, between stations within a service, and between the Defense Supply Agency and its activities.

Since July 1955 the Department of Defense has prescribed that the military departments, in peacetime, should place optimum reliance upon local management and procurement of material. The applicable DOD Instruction directs that:

Consistent with military necessity, the Department of Defense in peacetime will place optimum reliance on local management and procurement of required material, with optimum elimination of the use of Department of Defense storage and distribution systems and related services. Where it is considered by the inventory control point or commodity Single Manager that a decentralized item would not be available in sufficient quantity to requiring activities or installations in a period of mobilization or war, plans will be formulated by the inventory control point or commodity Single Manager to revert to centralized control when mobilization or wartime conditions make it necessary.²

At Army locations GAO found that anticipated usage of an item primarily determined whether it would be centrally

²Department of Defense Instruction 4140.7 dated 9 February 1961, Subject: Control, Supply and Positioning of Material

stocked. At the Engineer Maintenance Center, for example, items were selected for stockage on the basis of anticipated annual requirements of as low as 5 items per 100 pieces of supported equipment. An item was retained in central stocks under criteria which included: (1) the item is requested 3 times a year, or once a year for missile components; (2) the item is on an overseas stock list; and, (3) the item has a mobilization reserve requirement.³

At the Yards and Docks Supply Office, GAO found that items qualified for central stockage on the basis of actual or anticipated issues amounting to \$200 or more annually.⁴

Air Force Regulations provide that "no item will be designated for base procurement (i.e., local purchase) unless it meets all of the following criteria: (1) the item is a commercial type, (2) the item is in commercial distribution, (3) the item does not require detailed military inspection and quality control at base level, and (4) the item does not affect flying safety nor the required performance of an aircraft or missile."⁵ In September 1961 the regulation was revised and criteria (4) was deleted.

³ Comptroller General of the United States Report Number B-146828 dated 29 November 1963, Subject: Report on Uneconomical Management of Commercially Available Items, p. 22.

⁴ Ibid., p. 23.

⁵ Air Force Regulation 67-3 dated 20 March 1958.

The Defense Industrial Supply Center regulation states that its policy is to decontrol items to the maximum practicable extent and that centrally managed items be screened, as time permits, for possible decontrol.⁶

All of the DOD and the services directives, except the Air Force, restrict local purchases to the immediate local trade area. However, an analysis by the Armed Forces Supply Support Center showed that from 26 to 68 percent of all local purchases were actually made outside a 100 mile radius of the installation.⁷ Thus, it is apparent that existing regulations are more restrictive than necessary according to actual practices of some using activities in selecting the most expedient supply source.

From the above information it is readily apparent that a program must be initiated within the Department of Defense to provide a policy and definitive criteria for deciding on centralized versus decentralized methods of management of all items of supply.

⁶Comptroller General Report, loc. cit.

⁷Armed Forces Supply Support Center Study Project 59-3 dated November 1959.

CHAPTER III

ANALYSIS OF GENERAL ACCOUNTING OFFICE REPORT

General Accounting Office Report Number B-146828 was critically analyzed in order to examine the cost and statistical data that the report developed. The result of this examination and comments on the report are summarized in the paragraphs that follow.

I. METHOD OF DETERMINING COSTS

In determining the total number of line items that GAO felt could be decentralized, six Department of Defense Inventory Control Points were studied:

Defense Industrial Supply Center, Philadelphia, Penna. (DISC)	47,000 line items
--	-------------------

Engineering Maintenance Center, Columbus, Ohio (EMC)	107,000 line items
---	--------------------

Yards and Docks Supply Office, Port Hueneme, Calif. (YDSO)	108,000 line items
---	--------------------

Aviation and Surface Material Command, St. Louis, Mo. (AVSCOM)	209,000 line items
---	--------------------

Rome Air Material Area, Rome, New York (ROAMA)	87,000 line items
---	-------------------

Mobile Air Material Area, Mobile, Alabama (MOAMA)	243,000 line items
--	--------------------

The GAO report looked at 561,000 minor items of supply, consisting primarily of hardware, repair parts, industrial supplies, and other low volume items, at the six inventory control points. Of the 561,000 items, 471,000, or 84%, had

an annual sales issue value to retail customers of less than \$400. 258,000, or 46%, had no issues at all during the current year. From the arbitrary cutoff of \$400 the GAO estimated that the economies of central procurement would outweigh the additional costs incurred by central management and therefore concentrated on the items with issues under \$400.

From the 471,000 items available and meeting the dollar limitations of annual issues, 2,614 items were selected by random or systematic sampling methods for detailed examination. (The method of selecting the items is discussed in detail in a later section of this chapter.)

The 2,614 supply items selected were not in proportion to the number of items stocked. No attempt was made to pinpoint trouble areas, or determine that one Inventory Control Point had more of a problem than others, or that one area was more susceptible to decentralization than another.

From the 2,614 items selected the GAO determined, either by personal visit or correspondence with the retailers or distributors, that the item was available at the local level. If not available at the local level, manufacturers were contacted to see if the item was nationally distributed and the length of time required to obtain the item. The item was considered readily available if it was either in stock locally or could be obtained from the factory within a 30 day period,

since this compared favorably with the issue time for a routine demand from central inventory control points.

Using the above criteria, the GAO determined that 942 items, or 36% of the total, were readily available from commercial sources. There appears to be a discrepancy in the number of items that were considered as being available from commercial sources as the report further states: "A projection of the results of our tests to the 471,538 low volume minor line items of supply in inventories at the six central inventory control points reviewed indicated that about 150,300 items, or 32 percent, could have been decontrolled and procured directly by using activities." The discrepancy of 4 percent in the above figures cannot be reconciled. Since the total number of items that were considered available from commercial sources was based upon this percentage, the projected savings cannot be derived.

II. COST SAVINGS

The GAO report developed an annual average cost of \$114 to centrally manage a minor item of supply. This figure was derived by taking the total operating costs of an activity (Central Inventory Control Point), excluding certain costs, such as staff and command organizational costs, high value item management costs, and the non-applicable operating costs, and dividing this total by the number of minor supply items managed. Although this figure will give a manager a rough

estimate of costs it does not appear to have sufficient validity to actually make a determination in the final analysis whether an item should be centrally or decentrally managed.

The GAO report made the rather heroic assumption that the costs to obtain an item by local purchase were practically the same as to order the item for resupply from a military depot.

The report compared the price paid for an item by inventory managers against local procurement prices, and found that the local procurement prices exceeded the central procurement prices by 30 percent. (This percentage was based on a sample of only 274 out of the 2,614 items examined.) The potential savings were then derived by the following computation:

(1) Multiply the central management cost of \$114 per line item by the total number of items in the 6 Inventory Control Points to be decentralized. As noted above, this figure turned out to be 150,300, although the method of determination could not be validated.

$\$114 \times 150,300 \text{ items equals } \$17,134,200$

(2) Subtract 30% that the local purchase price exceeded the central procurement price times 150,300 items times average annual issue of \$46.

$30\% \times 150,300 \text{ items} \times \$46 \text{ per item equals } \$2,074,100$

(3) This gave a potential savings on the 150,300 items of \$15,060,100. (Item (1) less item (2)).

This savings was then projected to the entire Department of Defense range of items by the following method:

- (a) The 6 Inventory Control Points studied were responsible for approximately one million items of minor supply. Of these, as previously noted, 150,300 were recommended for decentralization, or about 15% of the total items.
- (b) This 15% was projected to the total Department of Defense range of items of 4.8 million, less 1 million items in Federal Supply Classification classes 10-24 (major end items and military equipments), for a total of approximately 550,000 recommended for decentralization over the entire Department of Defense range.
- (c) Based on the savings of \$15,060,100 on the 150,300 items noted above, a savings of about \$50,000,000 was developed.

The requirements for control and positioning of material by the Inventory Control Points are set forth in DOD Instruction 4140.7 dated 9 February 1961. This instruction gives definitive guidelines to the DOD activities with regard to the determination of centralized versus decentralized management. It is therefore somewhat disturbing to find that of the range of items examined by GAO, on a projected basis, 46% had no movement during the year, another 11% had average issues under \$10, and a total of 84% had issues of under \$400 per

year, and all were still being centrally managed. There is little doubt that GAO has hit upon a fertile area, and that the inventory managers need to take a hard look at the items that they manage, with a view toward reducing expenditures by decentralized management. There is no argument with the inactivity of centrally managed items that GAO pointed out; however, there is some doubt as to the magnitude of savings that could be affected. It is the intention to further analyze these savings, and propose, within the limitations of time and information available, a better method to determine the scope of control of an item, including the development of a mathematical model.

III. STATISTICAL METHODS

The use of statistical methods to make a judgement or inference about the aggregate or universe is scientifically sound. However, statistical data upon which the judgement or inference is made must be collected or secured in a manner that will not bias the data and thus the results. This is done by random sampling.

A detailed examination of the GAO report reveals that the Inventory Control Points and the items of supply that were investigated were not necessarily selected by random means and thus the results of the survey may be biased.

For example, no indication is made of how the supply activities were selected. At AVSCOM 475 items were

selected at random from a machine listing. At EMC a machine print-out of ready issuable stock with annual demands of under \$400 was used and every 150th item selected. The report does not indicate how the items were selected for review at the other four activities.

A machine print-out by Federal Stock Number or FIIN number is not a random listing due to the biased method of assignment of the Federal Stock Number; therefore, selection of every Nth item does not produce an unbiased selective random sample. Only random samples permit objective generalizations from the sample to the whole population.

The science of statistics is important in all phases of sample design and analysis. The concept of a sample drawn from a universe or population is fundamental in statistical theory. That universe is an aggregate of a finite number or infinite number of units of a specified kind, each unit having associated with it one or more attributes or quantitative measurements which are to be studied. The statistician thinks in terms of one or more numerical constants or parameters that are characteristic of, or specify, his population. Such a parameter might be the average of all measurements of a particular type in the entire population, the percent of units falling in a particular category, or some other descriptive characteristic of the population. Corresponding estimates of the parameters, computed from only the sample data, are

known as statistics. The practical sampler makes use of these ideas whenever he attempts to draw inferences about a universe from sample data.

In sampling, as in any statistical problem, the first consideration is to define the universe to which the estimates are to apply. This definition must be specific and it should be laid down before the sample is drawn. A universe may be either finite or infinite. An infinite universe consists of an unlimited supply of units while a finite universe consists of a specified number of units. The theory of statistics usually deals with an infinite universe. But in most sampling problems the universe is finite; this means that the usual rules utilized must be modified to be applicable.

The individual units making up the universe do not have to be natural elements; they may be defined in any way that is convenient for practical purposes. A sample should be drawn from the universe according to some rule specifying which units are to be selected. This means that the universe must be defined in terms of units to which such a rule can be applied.⁸

There are several methods of taking samples. Among the most common ones are:

⁸Walter A. Hendricks, The Mathematical Theory of Sampling (New Brunswick, New Jersey: The Scarecrow Press, 1956), pp. 1-22.

- (1) Simple Random Sampling
 - (a) Purposive Selection
- (2) Systematic Sampling
- (3) Stratified Random Sampling
- (4) Cluster Sampling
- (5) Quota Sampling
- (6) Area Sampling

A sample is a selected portion of some universe drawn to provide information about the universe as a whole. A sample must be drawn from a universe according to definite rules. The rules specifying how individual units are to be selected constitute the sample design.

One of the most elementary sample designs is the Simple Random Sample. It is important to remember that a simple random sample of "n" sampling units must be selected in such a way that every combination of "n" sampling units that can be formed has an equal chance of being selected. As indicated previously, a simple random sample of "n" can be obtained by drawing "n" sampling units from the universe one at a time, without replacement, in such a way that each unit present in the universe at every draw has an equal chance of being selected.⁹

The simple random sample has many attractive features. It yields unbiased estimates when unbiased methods of estimation

⁹Ibid., p. 13.

are used, and the unbiased estimating procedures usually take rather simple forms. Secondly, the statistical analysis of data from such a sample usually involves mathematical formulas of minimum complexity. It is often said that the random design insures that the sample will be "representative" of the universe from which it is drawn. But it will be "representative" only in the sense that it is unbiased; any one sample may fail considerably to give a good picture of the universe from which it was drawn. In an unlimited number of repeated trials all errors would average out; however, a sampling method that will produce the right answer with a single sample is desired.

There is usually considerable variability between sampling units with respect to the characteristic under investigation; consequently, estimates derived from simple random samples are subject to large sampling errors. These large errors can be reduced when the sample size is small by making "purposive selection": A method of selecting individual sampling units by inspection to make the sample conform as closely as possible to the universe.

The objective of purposive selection is good; however, there is a question as to whether or not the objective is actually attained in practice. The precision with which a purposive sample represents the universe depends largely upon the skill of the person who selects it. Individuals often differ

in their judgements about the set of sampling units which is most representative of the universe as a whole. Errors of judgement made by an individual usually do not average out in repeated trials. Every individual has a personal bias in one direction or the other of which he may be completely unaware; the nature and degree of the bias may vary from one individual to another. To some extent, such personal biases can be made smaller through training and experience, but it seems to be impossible to get rid of them entirely. The presence, or at least the likelihood of the presence, of such biases in purposive samples constitutes an objection to their use.

Simple random sampling eliminates all personal bias from the selection of sample units, the sample data themselves would supply all the information needed to compute valid estimates of precision, and conclusions about the universe could be expressed as probability statements. However, suppose that only one sampling unit is to be drawn from a universe for study. Obviously, if it were selected at random it might be one that was not at all typical of the universe as a whole. If all units in the universe were inspected and one selected by judgement it would very likely be more representative. The personal bias, if any, of the individual who selected the unit would practically always be smaller than the sampling error associated with a random selection. Now suppose two units

are to be selected. The average for two units chosen by purposive selection would also come closer to the universe average than would an average from a random sample of two. But, if this experiment were continued with progressively larger samples, experience has shown that the standard error of an average estimated from a random sample becomes progressively smaller as the simple size becomes larger; it can be made as small as desired by taking a sufficiently large sample. But with the purposive sample any personal bias on the part of the individual making the selection tends to remain at about the same size. With smaller samples the bias, and therefore the error, from the purposive sample is smaller than the error for a random sample; but with large samples that bias eventually exceeds the sampling error from the random sample.¹⁰

If a random sample is to be selected from a universe, an identification number is attached to each unit and the selection is made by means of a table of random numbers. Such tables contain numbers made up of randomly assorted digits so that when a set of consecutive numbers is taken from the table and used to specify the sampling units to be selected, the resulting sample will be an unbiased random sample.

¹⁰
Ibid., pp. 15-17.

If the clerical work of assigning identification numbers becomes impractical due to the number of units in the universe a second method of taking a random sample is utilized which is called a systematic sample. In a systematic sample the units of the universe are listed by some random means. The first unit is selected by the use of a table of random numbers and then every Nth unit is selected. When units are listed in a random order a systematic sample will behave as a random sample and for all practical purposes it may be regarded as a random sample so long as the starting unit is selected at random.

Simple random sampling, purposive selection random sampling or systematic selection appear to be the sample design methods most adaptable to the records available at any supply activity. By using any one of these three methods an unbiased sample can be drawn, upon which an inference about the aggregate universe can be made that is scientifically sound.

In some special cases other more elaborate sampling methods might be utilized. A brief description of these methods follows.

In stratified random sampling the population is divided into a number of sub-groups according to some relevant

characteristic, and a simple random sample is then taken from each group.¹¹

Cluster sampling refers to sample designs in which groups of neighboring individuals are used as sample units. A segment of an area is regarded as a cluster. In most applications of cluster sampling, every individual in the cluster is contacted.¹²

A quota sample is a judgement sample. In a quota sample, the interviewer is required to question a certain number of persons with given characteristics; for instance, he may be asked to interview twenty men living in a certain group of blocks, who fall within a certain age class, and whose income falls within a given range.¹³

Area sampling is an application of cluster sampling - with other design features interwoven - dispersed populations. It is based on a simple idea: The units in the population can be associated with geographical areas. By drawing a probability sample of these areas, and sampling appropriately within them, it is possible to obtain a probability sample of the population.¹⁴

¹¹W. Allen Wallis and Harry V. Roberts, Statistics A New Approach (Glencoe, Illinois: The Free Press, 1956), pp. 117-119.

¹²Hendricks, op. cit., pp. 250-251.

¹³John Neter and William Wasserman, Fundamental Statistics for Business and Economics (New York: Allyn and Bacon, Inc., 1956), p. 294.

¹⁴Wallis, op. cit., p. 489.

CHAPTER IV

FACTORS AFFECTING MANAGEMENT CRITERIA

The decision to centralize or decentralize the management of any item of supply is not an easy one when all factors are taken into account. The economic factors, though important, may not be the critical factors to be considered. In fact, several non-economic factors must be investigated and certain criteria met prior to consideration of the economic aspects of the problem.

In the subsequent paragraphs several economic and non-economic factors are listed which may affect any decision. A brief description of each factor is given along with an evaluation of its affect on the problem of centralized versus decentralized management of an item of supply.

I. NON-ECONOMIC FACTORS

Commercial or Government Services Administration Availability

The first consideration in determining whether to decentralize or continue to centrally manage an item is the ready availability of the item at the decentralized location, in sufficient quantity to fill all the demands. In terms of "ready availability" the same delivery criteria should be applied to the item that is applied to items ordered through a centralized inventory control point. Emergency requests (based

on a uniform military priority system) should be available instantaneously, up to a maximum of 24 to 48 hours. Routine requests should be available within 30 days. (This is the average length of time required by using activities to obtain a routine item through a centralized inventory control system, without the use of any premium handling or premium transportation.)

Those items which the Government Services Administration (GSA) has accepted management control should be readily identifiable and this information could be published in the various stock lists of material (catalogs). These items would normally be the items for which GSA already has management control, (e.g., office equipment and supplies) or new items that the service organizations are offering to GSA prior to decentralization. Current DOD policy requires that GSA must be given a chance to incorporate the item into its system, once the Inventory Control Point has decided it does not want to centrally manage the item. It should be noted that at this point the subject of the responsiveness of GSA to military requirements is still an unknown quantity. Because of the nature of office machines and supplies, the urgency of requirements is not very high, and therefore GSA has not been called upon to exert any speedy response, but if they get into the area of pure military items, this problem may deserve further consideration and study.

The remaining items subject to commercial availability would require considerable more research. Information available to the decontrolling inventory control point through procurement records might well provide the information as to the availability of the item at the local level, through regional or national distributors. If this information is not available at the Inventory Control Point, the information must be obtained from manufacturers, and wholesalers or distributors. Due to the potential volume of stock numbers that could feasibly be involved in a management decision, this information should be the responsibility of the decontrolling Inventory Control Point, and not be left to the local level to obtain. Care should be taken to ensure that the same item that is being centrally managed would be available commercially. Certainly items with a military specification, or even with certain required military characteristics should be subject to close inspection if the identical item purchased at the central level is to be available commercially. GAO stated in their report that items were "in stock locally" or "available in 1 to 30 days", when they contacted retailers, distributors, and manufacturers. It has been the writers' experience in military procurement that distributors are prone to inflate their availability, and the real proof of actual delivery times will only be determined when some procurement experience has been gained by actual orders. Of

particular importance to the Navy will be the response to a demand by a deployed ship for a decontrolled item. It will make little difference to the ship whether the item is centrally or decentrally managed, as long as it is available when demanded.

In addition to the item being commercially available, it must be available in sufficient quantities to meet military requirements. An item may be commercially available but not generally available through commercial distributor's channels in the quantity required by the military installation. For example replacement requirements may be available in quantities required from commercial sources, but initial requirements necessary for set assembly programs are generally of greater quantity and must be available at a specific time and may require special production runs to produce the required quantity. Also, the requirements for afloat and overseas commands may be larger in quantity than is normally available on the commercial market.¹⁵

It is apparent then, that a determination of commercial availability is an important decision in decentralization, and one that will require a great amount of research, and perhaps some actual experience to determine ready availability. If a favorable determination is not reached on this very important

¹⁵Defense General Supply Center, Directorate for Supply Control Policies and Procedures Number 701-1 dated 19 August 1962, Subject: Criteria for Determining Centralized Versus Decentralized Item Management, Sub-Paragraph 7a.

factor there is no need to proceed further in a management decision on decentralization.

Feasibility of Central Forecasting

Before an item can be effectively centrally managed, it must be determined that it is feasible to centrally forecast requirements for the item and the essentiality of central accumulation of consumption data on the item for management purposes.

There are various tools of central forecasting, and with the range of choices available today, in our sophisticated inventory system, the inventory manager should be able to make a reasonable forecast, using the scientific methods available.

The inventory manager, through the use of Automatic Data Processing has a variety of forecasting systems available. Below is a partial list of choices available to him for forecasting future requirements.

Last period's demand. This implies simply taking the last period's demand as the basis for ordering the next period's requirement.¹⁶

Simple average. Divide the available consumption by the

¹⁶ Robert G. Brown, Statistical Forecasting for Inventory Control (New York: McGraw-Hill Book Company, Inc., 1959), p. 3.

number of periods, either a predetermined number, or the total available.¹⁷

Moving average. This system involves dropping out the oldest demand information and adding the newest. The total is then divided by a predetermined number of periods. For example, a moving average over a 6 month period would drop out the first month's consumption, add the seventh month to obtain the existing 6 month average.¹⁸

Weighted moving average. A weighted moving average is similar to a moving average, except it places pre-determined weights on the figures, usually weighting the old average heavily, either .8 or .9, and the new data lightly, either .2 or .1. There are other refinements to this system, such as correction for trend, but these are considered beyond the scope of this paper.¹⁹

Exponential smoothing. This system is similar to the techniques of weighting moving average, but does not require the accumulation of excessive historical data.²⁰

Number of installed equipments. Number of equipments installed times a factor of spares required.

¹⁷Ibid., p. 27.

¹⁸Ibid., p. 12.

¹⁹Ibid., p. 35.

²⁰Ibid., p. 13.

Manufacturer's recommendations. In the absence of other information or if the equipment is completely new, the manufacturer's recommendations on items to be stocked may be the best information available.

It can easily be seen that if a manager desires to centrally manage an item he has a multitude of forecasting methods available. If he does determine to centrally manage, he must use some method of forecasting in order to stock on a system basis, regardless of validity.

If it is not possible to forecast centrally, or if it is not essential to centrally accumulate demand data, then the item should not even be considered for central management.

Decentralization of the decision-making function has many advantages. The man on the spot can act quickly and flexibly as he has intimate first-hand knowledge of many factors relevant to his decisions. Large hierarchical organizations, by contrast, tend to be sluggish and hidebound by rules and regulations. Much of their time is consumed in attempting to assemble, at the center, the information so readily available "on the firing line"; since their efforts are very rarely successful, their decisions have to be made on the basis of information that is both incomplete and stale.²¹

²¹ Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age (Cambridge, Massachusetts: Harvard University Press, 1961), pp. 236-239.

Degree of Perishability (Shelf Life)

If an item has a short shelf life, it is a prime candidate for decentralization. It is reasonable to assume that an item that will deteriorate within a short period of time should not be centrally procured, because it will be subject to deterioration before use unless it is pre-positioned in exactly the right quantities by location, which isn't likely under the DSA concept of using intermediate distribution depots.

Perishability also becomes a limiting parameter in determining the economic order quantity to procure. If an item has a 6 month shelf life, this is the maximum quantity that can be bought, regardless of the economic order quantity.

The old General Stores Supply Office, the Military Industrial Supply Agency, and the current Defense Industrial Supply Center use a figure of 6 months shelf life, and decontrol all items below this figure.

Perishability includes such terms as shelf life, deterioration, and required check and test procedures.

Rate of Obsolescence

Before the economic factors of controlling an item are considered, the rate of obsolescence should be studied. There are two schools of thought on this subject, relative to the degree of information available.

If one could assume near perfect information at the local level, as to the various factors leading toward obsolescence

it would be better to have the item decentrally managed, so that stocks could be policed and held to a minimum. This would minimize the dollar value of losses due to requirements that no longer existed.

If, however, adequate information concerning obsolescence is not available, or used, at the local level, it would be better to centrally manage the item. It is considered more likely that the best information would be available at the Inventory Control Point, because of its access to more technical information, access to the original requiring activity (e.g., ASO to BuWeps and CNO), and the fact that you have "less fingers in the pie". When an error is made, however, it will be a big one, since it will be system wide, whereas locally only a few would perhaps make the same error. Hitch and McKean aptly expressed the idea when they said, "Unfortunately the superficial illogicalities of decentralization are more strikingly obvious than the deadening consequences of extreme centralization."²²

Central management would also lend itself to redistribution of existing stocks, vice procurement, of foreseeable obsolescent items.

Rate of Consumption

The determination of which item to consider for

²²Ibid., p. 238

decentralized management is probably one of the most controversial of the group. Ideally, if time permitted, each inventory manager would comply with the Department of Defense instructions on decentralization by making an item-by-item review, and considering all known factors for each item. However, time and money limitations preclude this for most items, particularly for low value ones, and a monetary cut-off may be used, based on annual sales volume.

GAO, in their report, used \$400 annual sales as the cut-off point. This appears to be quite a liberal figure, since most of the items considered were of the low value, non-technical category.

Defense General Supply Center, in its discussions on decentralized management, pointed out that item by item review was most desirable, but that if this were not possible, they recommended a \$75 annual central sales as a cut-off point. The old General Stores Supply Office used a figure of \$100 as the consideration point for decentralization, provided they had adequate data on which to base their determination.

Military Essentiality

Military essentiality has been described in varying terms by different writers. It has been called spare part essentiality, criticality, and shortage-penalty. Shortages of some parts are far more serious than shortages of others, and if these differences can be taken into account when making

procurement and stocking decisions, the usefulness of any given amount of inventory investment can be increased. The evaluation of supply management's performance also can be made more precise if the difference in shortage seriousness can be taken into consideration.²³

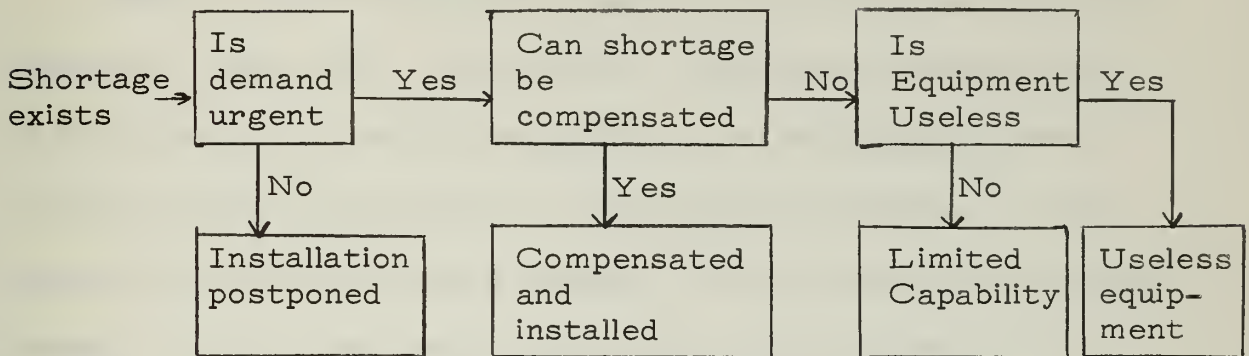
Military essentiality should play an important part in a decision to centrally or decentrally manage an item. The degree to which it is ranked in importance would be subject to the type of material being rated, and the mission of the equipment being supported. Obviously an item coded as support for a Polaris submarine will have a higher ranking than an item essential to an auxiliary vessel. The first consideration then in military essentiality is to devise a system of selecting those items which have a degree of essentiality. This is a major problem of a supply management system, and one which is almost a separate study in itself. Once the range of items has been determined, each item should be categorized as to its affect on the mission of the major equipment it is supporting. H. W. Karr, in his article "A Method of Estimating Spare-part Essentiality" uses two other factors, besides mission effect, namely urgency and compensability.²⁴

²³H. W. Karr, "A Method of Estimating Spare Part Essentiality", Naval Research Logistics Quarterly, Volume 5, 1958., p. 29.

²⁴Ibid., p. 33.

However, for purposes of this report the broad term "mission effect" is considered to encompass all the characteristics.

The effect of a shortage categorized as a "military essential" item becomes more apparent in the following schematic diagram:²⁵



It can be seen that once a requirement is categorized "essential", and the decision to install cannot be postponed or compensated, depending upon the degree of essentiality, the equipment either had limited capability or is useless.

Once all items have been coded as to "military essentiality", the question of decentralization must be faced. Department of Defense instructions on the subject, which are currently under review and revision, indicate that an inventory control manager should determine the feasibility or desirability of management only after this factor, along with several others, has been considered.²⁶ However, in the GAO report, although mobilization reserves were considered, military essentiality as

²⁵Ibid., p. 34.

²⁶Department of Defense Instruction 4140.7, op. cit., Paragraph VI.

such was not discussed. It is possible that the range of items examined were such that they had as yet not been classified as to "military essentiality" since they were more in the category of general purpose material.

Despite the uneconomical aspect of stocking and centrally managing, items with a high military essentiality coding should be considered for central management and stocking, because of their relative importance to the military operation. When projected across the entire system, into the areas of aircraft, weapon systems, and ships spare parts, this should be an important factor, and stock availability becomes decidedly more important than any economies of commercial procurement that might be gained.

Mobilization Reserves

Certain items in the military supply system are categorized as "mobilization reserves" because of their projected immediate requirements in the event of hostilities. Current DOD instructions provide that items normally available from commercial sources in sufficient quantities to meet war reserve military demands will not be selected as mobilization reserves. Exceptions are permitted when military considerations indicate that commercial type items must be prepositioned prior to mobilization day. When it is considered that a decentralized item would not be available in sufficient quantities to requiring activities in a period of mobilization

or war, plans should be formulated by the inventory manager or commodity manager to revert to centralized management when mobilization or wartime conditions make it necessary.²⁷

With the above criteria established by DOD, commercial availability appears to be an overriding factor to mobilization reserves. However, in making this determination the responsiveness of the commercial market to a crisis should be established. This involves a large area of judgement on what type of war will be waged. It appears in our national security planning we must consider three types of war - all out thermonuclear war, limited local actions of a holding or counter offensive character, or a large scale, prolonged type, like World War II, in which strategic bombing of cities is either withheld, or if attempted, is ineffective on both sides. Of the three, the prolonged World War II type appears the least likely.²⁸ Using the present DOD concept, this presupposes there will be adequate time available to re-control items that have been decontrolled, and there is therefore no necessity to have mobilization stocks of these items. Military essentiality and mobilization reserves go hand-in-hand, and if there is a feeling that time will be of the essence - that

²⁷ Department of Defense Instruction 4140.7, op. cit., Paragraph V(c).

²⁸ Hitch, op. cit., pp. 12-13.

there is not time to count on the civilian sources - then perhaps mobilization requirements should be the overriding factor, and not commercial availability.

Proximity of Requiring Activity

In order to decentralize an item, the requiring activity must not only have ready access to a local market, but it must have adequate procurement capabilities to make the desired purchases. Large service activities in large industrial complexes have no problem, but if you take away either the size or the market, problems may develop. The U. S. Naval Postgraduate School, Monterey is a point in case. Although the demands for material placed on it are relatively small, and of the normal variety, from the standpoint of a local market, there is not a great range of items available on the Monterey Peninsula and it lies just outside the oft quoted 100 mile radius of a large market, San Francisco. It does have a large military activity nearby, in Fort Ord and it could be utilized under cross-servicing arrangements.

This is also quite applicable for overseas activities and ships. The GAO report makes considerable note of the fact that designated purchasing activities could purchase and ship items in sufficient time to satisfy demands. Military essentiality would provide centralized management of those items so designated, and would therefore take care of the militarily more important items; however, for that range of items that

might otherwise be decentralized this factor would certainly have to be considered.

The Navy could use existing facilities at the Naval Supply Centers, Oakland and Norfolk to care for its deployed ships and overseas points. These centers are already organizationally in the DSA distribution system, and could be immediately utilized in the event of a decentralization decision. In order to satisfy overseas and ships demands in sufficient time it would appear that emergency procurement and premium transportation would have to be utilized in order to provide an acceptable service level. The alternative to this would be to maintain all items in stock for ships and overseas points; however, this could be contrary to other decentralization policies. It is beyond the scope of this paper to analyze the service rendered to ships and overseas points. This is an important point for Navy consideration, and for those items that will not be centrally managed due to military essentiality, a study should be conducted to determine in fact that port overseas supply activities, or inventory control points could provide adequate service without maintaining depot stocks.

Item Cube

Items which are large or bulky, or which have a high density in relation to the unit cost should be considered for decentralized management. The overriding factor in this point is transportation costs, both first destination and

subsequent destination costs. The classic example of high density, low unit cost items are building and construction materials (i.e., sand, gravel, etc.). These items are also expensive to store, regardless of management responsibility, and would have this further limiting factor, where it would probably be cheaper to procure as required, rather than to stock, subject to commercial availability and proximity to the source of supply.

Capitalization of Inventory

A possible limiting factor in determining whether to centrally or decentrally manage an item may well be the availability of funds. The Commanding Officer, Naval Supply Center, San Diego, commented that decentralized management today seems to be somewhat subject to dollar availability. The Naval Supply Center found that they were not managing local stocks in the best way possible, since for many commodities it was not possible to follow economic order quantity concepts, due to fund limitations. For instance, although it was manifestly more economical to buy 10 months stock of an item, applying the EOQ formula, the restrictions on funds available forced them to buy only 3 months stock. This requires the purchase to be made over three times as often, thus greatly increasing management costs.²⁹ The availability of funds,

²⁹Rear Admiral L. P. Kimball, Jr., SC, USN, Commanding Officer, Naval Supply Center, San Diego, letter dated 17 February 1964.

could, of course, be a limiting factor in either centralized or decentralized management. At the present time, however, adequate funds have been available to central managers to apply the EOQ concept, where applicable, whereas those items for which DSA is responsible, and have been decentralized to Navy managers at the local level, have been subject to rather severe financial limitations.³⁰

Military Specification Control

Specification control is a two sided coin, and presents both advantages and disadvantages to the case for decentralization. On the one hand it would place a technical responsibility on local procurement activities that they may not now possess. It would require large technical files, and a much greater knowledge of commodities than is now available at the local level. It would also greatly increase inspection responsibilities, which are presently accomplished at the source level for centrally managed bulk procurements by Inspectors of Naval Material, Bureau of Weapons Representatives, and like organizations. These increased responsibilities could well increase the costs of local procurement beyond the economic feasibility stage.

On the other hand, it is possible that we are buying

³⁰ Bureau of Supplies and Accounts Instruction 4440.80 Supplement 14 dated 27 January 1964, Subject: Improvement of Local Supply Decision Rules at Stock Points; program for

some quality in an item that is not required to satisfy local requirements - some "gold plating", in effect. An example that comes to mind is flashlights bought to a Military Specification. For many local requirements the standard hardware store type commercial flashlight would be acceptable, rather than the water-proof, shock-proof, anti-sparking, corrosion-resistant qualities incorporated in the MILSPEC item. There is a legitimate reason for the MILSPEC item, which we make all purposeful in order to compress the range of items, but it may not be the most economical buy for all requirements, particularly the stateside non-military type requirements.

Opportunity Losses

If one assumes that decentralized management provides more personalized scrutiny of requirements and stock levels, the losses associated with non-fulfillment of a requirement should be considered. In a military organization this is hard to quantify, because we do not have opportunity losses that private enterprises have. In effect we have a captive market, and we cannot rubber-stamp the demand "out of stock, try us again next month". There are losses associated with non receipt of material that can be quantified in terms of down time for vehicles and aircraft and the resultant re-scheduling of jobs. It should be determined which type management provides the best service and these opportunity losses then should be a part of the over-all determination of proper management.

II. ECONOMIC FACTORS

The non-economic factors previously discussed are individually and collectively sufficient justification to continue centralized management of a supply item. There is little point in considering an item for decentralization if it is not available commercially, has a high degree of military essentiality, or any of the other non-economic factors that favor or dictate central management. Once these factors have been considered, and the item meets the decentralization criteria from a non-economic standpoint, it becomes necessary to examine the economic factors and determine which system is the most advantageous in terms of dollars.

Government spending, in particularly military spending in peacetime, will continually be subject to review by the GAO and other agencies concerned with public spending. Unless there are overriding military decisions that dictate a more expensive method of operation we should be striving for that system that "provides the most bang for the bucks". There should be increased recognition and awareness that military decisions, whether they specifically involve budget allocations or not, are in one of their most important aspects economic decisions; and that unless the right questions are asked, the appropriate alternatives selected for comparison, and an economic criterion used for choosing the most efficient, military

power and national security will suffer.³¹

The ultimate goal is to arrive at a mathematical model that could make the determination of decentralization, but in order to do this, all pertinent economic factors must be analyzed.

Volume Purchases

It is generally considered that savings in purchase price can be effected by quantity buys on the theory that unit prices will decrease as the quantity increases. Economists generally believe that at sufficiently small outputs, efficiency increases with size, chiefly because of the possibility of specialization of labor and equipment with a resultant decrease in cost to produce.³² Large buys do not necessarily ensure the cheapest price, however. Due to economies of scale, prices will tend to fall with added output, until you reach the point of diminishing returns, and then the prices will start back up. Stigler defines the law of diminishing returns, "As equal increments of one output are added, the outputs of other productive services being held constant, beyond a certain point the resulting increments of product will decrease, i.e., the marginal products will diminish."³³ "Beyond a

³¹ Hitch, op. cit., p. 107.

³² George J. Stigler, The Theory of Price (New York: The Macmillan Company, 1962), p. 140.

³³ Ibid., pp. 111-112.

certain point" must be interpreted as a point within the productive range of industry. In addition prices may rise at the point in expanded productivity that efficiency begins to fall off, due to sluggish and bureaucratic tendencies of the firm at the increased level.³⁴

Another factor that might affect prices is that the requirements being generated are in excess of the lowest bidder's capacity to produce. This then forces the purchaser to take higher prices than could be obtained with decentralized procurement and resultant smaller quantities.³⁵

Savings attributable to centralized procurement have not been clearly identified. GAO, in the referenced report, used a figure of 30% of the unit cost as savings of centralized procurement.³⁶ Defense General Supply Center noted that costs at decentralized activities ran as high as 180% to higher than 400% of centralized costs.

This is probably the largest single area of savings that can be attributed to centralized management. The savings no doubt will vary with the commodity involved, but it is a factor that can readily be translated into a quantitative figure.

³⁴Ibid., p. 140.

³⁵Tibor Scitovsky, Welfare and Competition (Chicago: Richard D. Irwin, Inc., 1962), pp. 109-180.

³⁶Comptroller General Report, op. cit., p. 18.

Transportation Point Costs

Under the Defense Supply Agency distribution system, material is positioned at an intermediate depot, as opposed to the Navy's system of delivering the material directly to the user activity, based on a best guess of the ultimate user, both as to location and quantity. DSA has made some concessions to the Navy in this area by the use of Specialized Support Points (SSP) and Direct Supply Support Points (DSSP).³⁷ The SSP's at Norfolk and Oakland carry a full range of items for all DSA commodities with full management by the Navy. The DSSP's are located primarily at Air Stations, Shipyards and maintenance shops, and carry a range of specialized selected items of high volume usage. DSA retains ownership of all wholesale stocks under both systems until issued. The assumption made by GAO in the referenced report appears to be that the decentralized manager would be the ultimate user of the item, and that decentralized items would be available locally.

Under a centralized system, using an interim level depot to hold, the system is susceptible to first destination, second destination, and redistribution transportation costs. Decentralized management would be faced with first destination

³⁷Department of Defense, Defense Supply Agency Special Progress Report to the Defense Supply Council dated May 1963.

costs, but they would probably be built into the cost of the commercially available item, unless it is locally manufactured (most unlikely for a very large range of items). There should be no second destination or redistribution costs connected with decentralized management.

Holding Costs

Holding costs include such costs as deterioration, obsolescence, interest on investment, amortization of capital investment (facilities), overhead costs including personnel, utilities and supplies. Under a centralized management system the holding costs could be a substantial cost but would not be experienced under decentralized management because of the intermediate stocking level. The constant cost of a local holding cost under a decentralized stocking system would be experienced under either system and could therefore be disregarded. If, however, one assumes that inventories would be substantially less under a decentralized system, then a decrease in local holding costs would also have to be considered. GAO, in their report, stated that the entire range of 553,000 items would not be stocked, therefore freeing \$275,000,000 of unnecessary inventory. The Defense General Supply Center, however, takes the position that a local inventory policy would not differ greatly for a depot stocked item and a locally procured item.³⁸ If the inventory policy does differ increased

³⁸ Defense General Supply Center, P and P Number 701-1, op. cit., Enclosure (2), Note ID.

costs would be experienced by more frequent procurements at the local level.

GAO, using the \$275,000,000 as excess inventory computed a 3% interest on investment, or an annual cost of \$8,000,000. Hitch and McKean use a figure of 6 to 8 percent, which includes interest plus a risk premium.³⁹ In computing the interest, the future values of items and therefore the undiscounted amounts of future costs are extremely important. Future costs should be discounted, but distant amounts should be weighted less heavily than present ones. A dollar is worth more now than 10 years from now because (1) it can produce something or "grow" in the meantime, and (2) we prefer a unit of satisfaction now to one 10 years from now.

Administrative Costs

In determining the economics of centralized versus decentralized procurement, administrative cost to procure at the various levels will be a small factor. An assumption must first be made of the procurement and stocking policy of decentralized management. If it is considered that the decentralized item has such low demand as to not warrant stocking but will be bought on an "as required basis" many more procurements will be required at the local level, thus increasing local procurement costs. If the stocking policy is the same

³⁹Hitch, op. cit., pp. 210-211

under decentralized and centralized management there are other considerations. In the GAO report it was stated that there was little difference in cost to the local user between requisitioning from the higher echelon or procuring locally. They also stated that the Air Force study on this subject indicated that the costs of local procurement were exceeded by savings in other functions such as report preparation, requisitioning costs, packing and crating, and storage. The Defense General Supply Center report on this subject also indicated that local procurement costs and local requisitioning costs were substantially equal and therefore should not be an economic consideration in management decision.

One of the big projects in the requisitioning area in the past few years has been the Military Standard Requisitioning and Issue Procedures (MILSTRIP Program). It would appear that this program, if successful, would go a long way in reducing requisitioning costs, since it used punch card format and EAM equipment. Also, there are no inspection procedures or bill processing involved in requisitioning as opposed to local procurement. In spite of the statements by GAO and other agencies it is felt that this facet should be more carefully analyzed from the cost standpoint. Cost figures per line item or per requisition at the central management level should be quite easily identifiable.

Excess Stocks

A military supply system is subject to making many procurements of items that will never be used, due to rapidly changing equipments, changing missions, economic conditions, and certainly a lack of coordination between user and purchaser, due to the size of the organization. These purchases are legend in newspaper articles, and make excellent material for politicians to impress their constituents.

It therefore behooves the military to use the best system available to hold these excess losses to a minimum. In the field of missiles and aircraft or any technical procurement the losses are extremely high, because of the low return on sale of excesses in these areas. This problem should be carefully studied to determine whether decentralized management would hold losses to a minimum or whether they would actually increase when compared to losses attributable to central management.

The stocking policy in decentralized management will again be a big factor. If the policy is to buy only for immediate requirements then excesses should be held to a bare minimum, though many more procurements will be required than with central management.

By decentralizing, the advantages of redistribution of excesses by a central manager are lost, since he will not have the information available centrally on a system basis. He has

also lost the ability to examine the range of items and take policing action to compress this range by standardization and redistribution.

III. MATHEMATICAL MODEL OF ECONOMIC FACTORS

Although there are many unresolved areas in the noneconomic factors that require further study, once these have been resolved, the economic decision boils down to the following: How do the central costs, composed of the central unit price, cost to order, and cost to hold compare with the local unit cost to procure, the cost to order, and the cost to hold.

The Defense General Supply Center has developed a mathematical model to quantify the costs of centralized management versus decentralized management of supply items so that a comparison of the annual costs can be made. The model is reproduced below.

Annual Centralized Management Costs - TEC(C)

$$\begin{aligned} \text{TEC(C)} &= \text{Order Cost} + \text{Holding Cost} + \text{Cost of Item} \\ &= \frac{12B}{PC} + \frac{PC}{2} + SL \times \frac{D}{12} \times H \times UPC + D \times UPC \end{aligned}$$

$$\text{Cost as \% of Sales} = \frac{\text{TEC(C)}}{D \times UPC} \times 100$$

Annual Decentralized Management Costs - TEC(D)

⁴⁰ Defense General Supply Center, Richmond, Virginia
Briefing presented to the DSA Systems Symposium 23
April 1963

$$\begin{aligned} \text{TEC}(D) &= \text{Order Cost} + \text{Holding Cost} + \text{Cost of Item} \\ &= (\text{See note}) + (\text{See note}) + D \times \text{UPD} \end{aligned}$$

$$\begin{aligned} \text{Cost as \% of Sales} &= \frac{\text{TEC}(D)}{D \times \text{UPC}} \times 100 \\ &= \frac{\text{UPD}}{\text{UPC}} \times 100 \end{aligned}$$

Note: The following costs are equal and therefore excluded:

<u>From Centralized Costs</u>	<u>From Decentralized Cost</u>
Requisitioning Cost	= Cost to Procure
Cost to Hold Locally	= Cost to Hold

UPC - Estimated unit price - Centralized management
 UPD - Estimated unit price - Decentralized management
 PC - Order quantity in months of supply
 SL - Safety level in months of supply
 D - Annual demand in units
 H - Holding cost rate
 B - Cost to procure

This model covers the basic elements considered necessary to make the economic decisions. There are, however, two assumptions which are made that may be applicable to DGSC supported activities, but would require further investigation if projected across the entire DOD supply system. (1) DGSC disregarded "cost to hold" locally in the model on the assumption that the station's inventory policies will not differ greatly for a depot stocked item and a locally procured item. This is not in keeping with the GAO report when it was estimated that \$275 million in inventories could be freed under decentralized management. (2) DGSC stated that requisitioning costs under central management were equal to "cost to procure"

under decentralized management. This is an area that requires further investigation, particularly with the implementation of MILSTRIP procedures.

It is the writers' opinion that the model should be expanded to include the following:

Annual Centralized Management Costs - $TEC(C)$

$TEC(C) = \text{Order Cost} + \text{Holding Cost} + \text{Cost of Item} +$
 $\text{Requisitioning Cost} + \text{Cost to Hold Locally}$

Annual Decentralized Management Costs - $TEC(D)$

$TEC(D) = \text{Cost to Procure} + \text{Cost to Hold} + \text{Cost of Item}$

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

I. CONCLUSIONS

The GAO report makes a clear case that there are many items in the Department of Defense supply system that should be examined critically for decentralization. There are a wide range of low volume, low cost items that would lend themselves to decentralized management at a considerable savings to the services and little, if any, loss of responsiveness.

The statistical methods employed by GAO in arriving at the projected percentage of items that could be decentralized are subject to some skepticism that the results are statistically unbiased. It was not the intention of this paper to disprove GAO's statistics, but to examine them and offer some objective method of determining a decentralization policy. By the same token the cost savings and excess inventory figures are open to debate. Nevertheless, the basic conclusions of GAO are quite sound and it is evident from the report that the various supply agencies have not carried out the intentions of DOD Instructions as extensively as possible, or as necessary to attain optimal supply management.

It is known that the Defense Supply Agency is conducting an intensive study on the subject of total costs to manage

DSA items of supply.⁴¹ The impetus for this study is at least in part attributable to the GAO report on uneconomical management of commercially available items. Undoubtedly since DSA has assumed management of the bulk of common items these items would lend themselves more readily to commercial availability than the remaining technical items managed by the individual services. From available correspondence on the subject we were unable to determine that the Navy was taking any action on the subject. It is recommended that the Navy implement a similar study to enable their supply managers to make immediate decisions on decentralization. Although not a complete list, it is considered that the noneconomic factors listed in Chapter IV would form a good basis for selection of items for a decentralized review. It is patently obvious that unless an item can qualify for the noneconomic factors, there is little use to compute the economic factors. The first consideration in this decision should be the commercial availability - if the item is not available in sufficient quantities and in adequate time - there is no need to proceed further. The other items could be in the nature of a check list, ranked by their relative importance. Once the item meets all the criteria of the noneconomic factors, the big test of the economics of the decision should be determined.

⁴¹Commander R. J. Knobel, SC, USN, Defense Supply Agency Headquarters Staff, personal letter dated 17 December 1963.

As a final comment on the subject of decentralization, the reply of the Defense Industrial Supply Center to a DSA letter on "Control and Supply of Material" sounds an ominous note of warning. Paragraphs 3 and 4 of the letter are quoted below:⁴²

3. With respect to this policy, it is important to note that in the studies undertaken and in the policy declarations issued subsequent to its establishment, the Defense Supply Agency has given a broad and inclusive interpretation to the concept of integrated management. Under this interpretation, a center's responsibility begins with the provisioning conference, includes screening for item entry control, involves the obtaining of the federal stock number, the procurement and positioning within the DSA distribution system of initial retail support requirements and the subsequent procurement or procurement and stocking of wholesale support requirements. A center's responsibilities also include the requirement for performing standardization studies and for terminating items as rapidly as circumstances permit. Thus, an opportunity is presented for a single agency to police the entry of items into the DOD supply system, to act as the procurement and storage agency for the needs of all the services and to reduce through standardization action and otherwise the excessive number of items now in the Defense Supply System.

4. Decentralization of an item in the face of these assumed responsibilities and the opportunity they present does not appear proper. In the first place, decentralization neither eliminated procurement nor prevents stockage. It dissipates the former and both dissipates and hides the latter, leading once again to multi-service procurement and stockage of common military supplies. Secondly, decentralization divides management responsibility, leaving with the centers all responsibility except those pertaining to procurement and stocking, returning these to the very services that delegated them to the

⁴²Commander, Defense Industrial Supply Center letter dated 29 April 1963, Subject: Proposed DSA Regulation "Control and Supply of Material"

centers when the items were first coded for integrated management. The act of decentralization also denies on a routine basis two elements of supply intelligence necessary for the total management of an item. This lack of procurement and usage information will in an emergency prevent a center from providing adequate supply support for decentralized items which in that event must be returned to central management. It is a well accepted maxim that in time of peace we have the only opportunity to prepare for war. The best preparation for that event comes from the experience centers gain from the day-to-day management of the items for which they are responsible. Finally, the policy cannot be implemented completely. The Defense Supply Agency has recognized this fact by requiring DSCs to procure a decentralized item at the request of military activities. Thus, centers must be prepared to perform on an exception basis a function that standardized requisitioning procedures, rapid communication systems and advanced data processing equipment make administratively and economically feasible routinely.

In short, this quote expresses the writers' feelings that we have worked for many years to arrive at a central system of inventory management, hopefully under one organization (DSA) ultimately, and if the concept of decentralization is allowed to run rampant we could regress to the supply system of mid to late 1940's, with its overtones of duplication, expanded range of items and nonstandardization of materials. Therefore the decentralization policy should be rigidly controlled, notwithstanding the fact that decentralization is extremely desirable for an economic standpoint.

II. RECOMMENDATIONS FOR FURTHER STUDY

It is recommended that the following areas be further investigated with the purpose of determining the affect each

has on the problem of supply management.

Holding Costs

There was not sufficient information available to adequately determine the impact of holding costs in an economic decision to decentralize. The Defense General Supply Center's figure of 15% for holding costs could not be analyzed due to lack of information on the breakdown of the costs. This area is of sufficient importance because of its affect on the economic decision to warrant a further separate study. It is also closely associated with the study on inventory policy.

Inventory Policy

The subject of whether to stock under decentralization or to buy known requirements was not clearly defined in the GAO report. The decision on this policy will affect many factors, both economic and noneconomic. It is recommended that further study on this subject be conducted due to its impact on the whole problem.

Availability of Information at the Local Level

A decentralization management decision will require that many decisions formerly made centrally will now be made locally. Access to, and availability of, all information formerly available to a large central agency would have to be distributed to a great many users in a widely dispersed area. It is felt that that this policy would require further study.

Requisitioning Costs Versus Local Purchase Costs

From available information, it did not appear that the Navy had done much work on this subject. In order to make a meaningful comparison, the costs to requisition from the next higher echelon of supply should be carefully compared against all the costs to procure locally, including inspection costs, procurement costs, technical analysis of requirements and contract administration.

Military Essentiality and Mobilization Reserves

The problem of military essentiality was hardly touched upon in the GAO report. All inventory managers should consider this feature in decentralizing and from the information available to us, this problem requires further study and some common guidelines.

Responsiveness of Commercial Market and GSA

The test of the success of decentralization cannot be entirely tied to a dollar savings. The commercial market, or GSA, must be responsive to the military demands. So far this has not been tested to any great degree, and GAO based their report on replies from retailers, wholesalers and manufacturers, rather than on actual demands placed upon these outlets. Prior to making mass decentralization, a study should be conducted to actually test the responsiveness of these sources of supply.

Ships and Overseas Supply Support by Port Procurement

The impact of a decentralized policy on deployed ships and overseas bases merits further study. GAO touched very lightly on the Navy's position on this matter, and the affect of commercial buying of requests from these activities, as opposed to a policy of stocking at port depots should be further analyzed.

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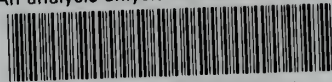
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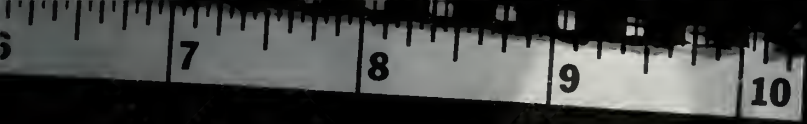
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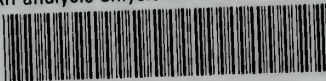
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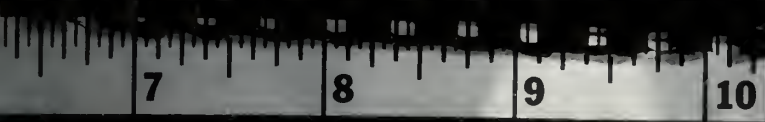
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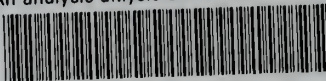
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